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Measuring Transactional Distance

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MEASURING TRANSACTIONAL DISTANCE

An Interactive Qualifying Project Report:

Submitted to the Faculty

Of the

WORCESTER POLYTECHNIC INSTITUTE

In partial fulfillment of the requirements for the

Degree of Bachelor of Science

By

Laura J. Bennett

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Approved:

Professor Karen Lemone, Advisor

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Abstract

Transactional Distance is the emotional dissociation felt by a student or teacher in the classroom setting. With the advent of new technology, allowing for a new class of learning, the transactional distance between the student and teacher in a web based learning environment was measured in this IQP, in order to prepare for future reformations of the virtual classroom. This measurement thus answered the goal question: does a large amount of transactional distance obstruct one's learning ability?

Executive Summary

Transactional Distance is the idea, developed by Michael Moore, that there exists a not only physical, but emotional and cognitive distance between educators, students, and various factors of learning environments. The higher the transactional distance, the farther away the individual feels from another individual or component of the learning environment. For example, in a large transactional distance situation, an educator can feel a large emotional distance from that of the student, or vice versa.

This IQP tended to the extension of this theory formulated by Saba and Shearer. This extension further extrapolates the theory and states that as the amount of dialogue in a learning environment increases, the transactional distance then decreases.

The first objective of this IQP was to measure this “transactional distance”. Surveys taken by students taking three graduate level computer science courses in the summer of 2007 were tabulated. These classes are “Foundations of Computer Science”, “Adaptive Web Technology”, and “Compiler Construction”. These surveys were taken after each week (module) of the course, and they basically asked the student how much contact he or she had with other students, professors, or teaching assistants. Scaling and weighting these amounts gave them numerical values, thus giving way for averaging and trend-line analysis.

The second objective of this IQP was to compare these measurements alongside comments made by the students in the survey about the associated module. Finally, the third objective of this IQP was to reorganize the existing survey in order to allow for better future measurements of transactional distance. These objectives then answered the

question, fulfilling the final goal; does a large amount of transactional distance hinder the student's learning experience?

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1.0 Introduction

Throughout history, the relationship between the teacher and the student was simple; the teacher taught the student with a face to face dialogue. This relationship has since evolved into a complicated network of internet correspondences, e-mails, and online tutorials. Since the educational value of either method of learning is essentially the same, one must question, does the high transactional distance between the instructor and the learner create a large enough obstacle that the education process can be hindered?

Before analyzing this question, one must also ask, what is transactional distance? Since “Distance Education” has existed for many years in a myriad forms including courses on tape, classes on radio and television, as well as internet courses, this question has existed for just as long, in fact, possibly longer. However, the measurement of the void between the student and the teacher has not been in the spotlight until this point due to the fact that the interaction between the student and the teacher was primarily face to face, rendering the popular need for such measurement “unnecessary”. The transactional distance between the teacher and the student can then be defined as the psychological or emotional distance between these two subjects. In a normal classroom setting, the instructor and the student are face to face; thus there is ability for normal dialogue. In an online based setting, however, the distance between the two subjects creates a void that hinders this beneficial dialogue.

This study picked up from the previous IQP in this subject written by Drew Ditto in 2005. In this IQP, alternatively to that of Ditto’s, in which the transactional distance between the student and student was measured, the distance felt between the educator and student is measured. Returning to the original question at hand, again, does this

transactional distance between the instructor and the learner create a large enough obstacle that the education process can be hindered? The goal of this project was to qualitatively and quantitatively answer this question. Considering the fact that the dataset used in this project is purely student opinion, it can be construed that the results were very difficult to evaluate in a traditional quantitative manner. Student opinion does not present itself in decimals and numbers; thus graphs and tables are harder to analyze.

Therefore, part of establishing this goal was to try to compute a new method of analyzing transactional distance in a web-based learning system by means of numbers and graphs. In past analyses of transactional distance, student opinion was individually examined to determine whether or not there was a large psychological void between the instructor and student. Therefore, this new method of analyzing transactional distance included scaling individual amounts of contact felt by each student, in order to calculate a larger number for each module of the course. These computations were then compared alongside comments and miscellaneous opinions provided by the students. This objective view gave the measurement a more robust end correlation.

In short, within this IQP, there is be a follow up evaluation of the previous analysis of transactional distance, as well as an attempted improvement upon the methodology of measuring transactional distance.

2.0 Background

Building a foundation in this project involves first realizing the history of the study of transactional distance. The historical relationship between the student and teacher has evolved into one that may never exist on a face-to-face basis. Therefore, this subject was created to allow a student teacher relationship become one with a smaller transactional distance.

2.1 Transactional Distance Theory

Before analyzing the effects of large physical distances between the teacher and the student, one must clearly define and analyze the original theory of transactional distance. Transactional distance basically can be defined as that physical distance that creates a psychological and communicative void. In the academic arena, this void would then allow for potential misunderstandings, or dialogue failures. (Dron, 2004)

In the example analyzed in this project, the transactional distance between the instructor and student exists in an Internet classroom setting. Labs and assignments are given via a class designated website that contains the course objectives and literature. This website also contains tools that allow the student to interact with other students by means of message boards and e-mail. These message boards give the student the ability to discuss homework issues, or general problems with the curriculum. Using these tools, students can replicate a study session online, by asking each other questions about the assignments given. In traditional classroom settings, students would have to create their own meeting times in order to compare notes and assignments. In this situation, students are given the built in opportunity to constantly share work and ideas.

2.1.1 Michael Moore's Transactional Distance

Transactional distance was first defined and theorized by Michael G. Moore. It is defined as the degree of separation between students and teachers, and sometimes amongst the students themselves. In this study, the Transactional Distance Theory is demonstrated through distance education computer science courses. It is usually associated with these types of courses; however it can be evaluated through many types of student and teacher situations.

First, one must dissect the actual nomenclature for the theory itself. Using the term transaction notes that the relationship between the student and the teacher is an ongoing action, and that both parties are actively taking part in. This action includes the learner participating in classroom dialogue, and reacting to dialogue and instruction received from the teacher. Moore states that,

“The dialogue produces a response. The dynamic interplay between learner and instructor and learner and content are continuous during which meaning evolves. The created response is the realized experience of the learner. Each transaction by a learner, will be unique as the learner's frame of mind, situation, and experiences evolve” (Moore and Kearsley, 2004).

Moore first developed the transactional distance theory in 1972, however, he did not completely articulate the actual “Transactional Distance” term until 1980.

Moore further evaluated his theory, in order to completely define transactional distance, and he did as such in 1993. In his work *Theory of Transactional Distance*, he fully defined his theory as “the context of interaction in an instructional program, as a function of dialogue, structure, and learner autonomy.” (Moore, 1993) In this work, Moore places special regards with dialogue. Moore referred to dialogue as the teacher-student

interaction; more specifically, he refers to dialogue as the academic interaction between the teacher and student in which communication involves instruction and response. The extent and nature of this dialog is determined by the educational philosophy of the individual or group responsible for the design of the course, the personalities of teacher and learner, the subject matter of the course, and the environmental factors.

(Moore and Kearsley, p. 201)

In this case, when referring to structure, Moore and Kearsley are speaking about the organization of the course. Learner autonomy refers to “the characteristic of self-direction.” (Moore, 1991) In this sense, Moore is defining the ability for the student to work alone as a major factor in the transactional distance theory.

This theory gives instructors and designers the effective background in order to create a balanced environment for the scholar. These integral ideas create a “happy medium” between interaction (dialogue) and structure for a more robust academic experience. The interplay of dialogue and structure was evaluated in this project on the student to teacher basis, measuring the distance felt by the student in the virtual classroom setting.

2.1.2 Saba’s Empirical Evaluation of Moore’s Theory

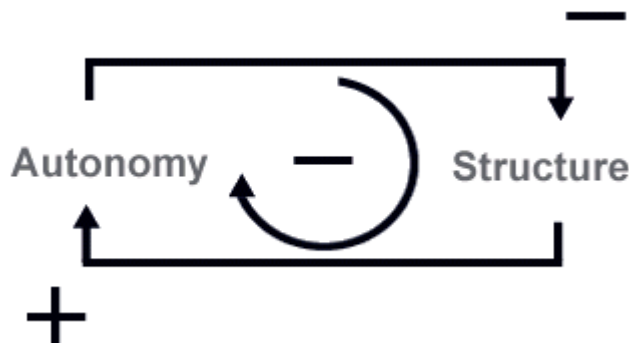
Farhad Saba, much like Moore, is a professor who specializes in distance education, and the theories structured with it. As a pioneer in the field of distance education, Saba further explored the theory of transactional distance.

In 1988, Farhad Saba expanded Moore's theory by adding new variables that have not been considered before. Using system dynamics, he added the control that the student and the teacher add into the academic dynamic. Using a computer simulation based on systems dynamics modeling techniques, Saba describes the interrelationships between dialogue and structure variables. This controlled experiment tested and verified the patterned relations between transactional distance, dialogue, and structure: transactional distance increases when dialogue decreases and structure increases. (Saba and Shearer)

In his works, Saba also elaborated upon Moore's definition of structure. Here, he referred to refers to structure as the "responsiveness" of the educational plan to the individual student.

The importance of Saba's findings is that he believed that one can create predictable outcomes of transactional distance. This, he calculated, can be demonstrated by the increase or decrease of either structure or dialogue within the teacher-student relationship.

Saba further developed his relationships by describing a negative relationship between that of the learner's autonomy, as described earlier, and the structure provided by the teacher. In other words, the more structure implemented by the teacher, the less learner autonomy, and vice versa.



Source: “Understanding Distance Education Systems Methodology”, Farhad Saba
(<http://www.distance-educator.com/saba/modules.php?op=modload&name=Sections&fileindex&req=printpage&artid=4>)

2.1.3 The Importance of Empirical Data

Moore and Saba have both called for furthering the empirical analysis of the Transactional Distance Theory. With a numerical or mathematical analysis of the transactional distance theory, one can use the previous relationships in order to properly measure the amount of structure needed, or the amount of learner autonomy expected. These two values could then be measured in hours or other numerical measurements; for example, a student could then be expected to sign on to the course’s website for an allotted amount of time in order to lessen the transactional distance between the student and the teacher. This project furthered this cause by attempting to scientifically compare the surveys from the distance learning courses studied, and to figure out a way to properly measure this transactional distance in the future.

2.2 Measurement by Survey

The human factor involved in any data acquisition process is the subject matter expert. In any project, the existence of a subject matter expert adds a new dimension to the data acquired due to his or her hands-on experience. The interviewer, or surveyor can then tap the knowledge of the subject matter expert (SME) of the subject involved in the project. In this case, the subject matter expert is the student who is taking part in the

class. Their knowledge of the course will allow for a better measurement of the transactional distance he or she felt for the duration of the course.

Developing sufficient subject matter background gives the interviewer a firm grasp on what data is being acquired. This background data would instill confidence in the SME, thus encouraging them to relay appropriate data. In this development, SME will be instructed as to what the end result of the project will be. Also understanding this, the SME will be able to reflect upon their knowledge in an efficient manner. For this case, the background knowledge development includes proper information about what occurred during class time, the rapport developed between the student and the teacher, and the expectations of the student. Having familiarity with these key aspects will allow the survey taker to understand the importance and value of the survey's final results. Effectively transitioning the interview from one topic to another is very important, in order to not agitate the SME. This will hopefully transition information retrieval process to other parcels of information effectively. Building a rapport with interviewees will also be required to keep the SME interested in the goal of retrieving all the data correctly. Usually, if the interviewee commits 15 minutes; commit to 15 minutes as the interviewer. Avoiding bias is a very big concern for the interviewer. In this case, avoiding bias could mean not coaching the SME just to retrieve an answer, or keeping each interviewee separate, in order to obtain a complete set of data. This also means keeping an unbiased view for both the educator, and the learner. In some cases, the student will feel discontent towards the educator due to problems that occurred during the class time. In this case, a biased interview or survey will skew their corresponding answers. Before the interview, if an objective questionnaire is created, it will allow the SME input data much

easier, and will allow the interviewer to collect the data in a way that will give way for comparison much easier. Compiling a grid of numbers that the SME must fill out gives the interviewer the opportunity to compare each SME's data to each other in a simpler way. Consistency in the data acquisition will also give the end product more esteem when reviewed.

3.0 Methodology

In order to complete the final goal of analyzing whether or not a large amount of transactional distance affects one's ability to learn, some objectives needed to be addressed. These objectives included first measuring transactional distance taken from surveys filled out by distance-learning students. The second objective was to incorporate subjective comments inserted into the survey by the individual students. Tying these two factors together fulfilled the end goal.

3.1 Measuring Transactional Distance

Risking possibly sacrificing valuable data, the question of what type of measurement this project will use arises. Given that the data collected from previous surveys could be qualitative, rather than quantitative, a proper manner of measurement must be introduced. In this project, the survey was used as the primary source of feedback from the student, and the interaction between the instructor and the student was be evaluated.

Establishing a basis in the idea elaborated by Saba that transactional distance increases as dialogue decreases and structure increases, the measurement of the survey pointed the data in the direction of resulting in a survey with improvements that more effectively measured the quality of the dialogue and structure.

3.1.1 Previous Survey

In the fall of 2005, WPI student Drew Ditto performed the same measurement of transactional distance in a project, which resulted in a comprehensive survey. This survey was used by Professor Karen Lemone for three graduate level Computer Science courses. (See Appendix for Survey). This survey was elaborated upon an initial survey,

created by Paula Quinn. The survey was a mix of two categories of questions; those inserted by Quinn that targeted general student interest and satisfaction, and those inserted by Professor Lemone, which targeted measuring transactional distance. (Ditto, 2005)

3.1.2 Measurements from Ditto Survey

The improvements made by Ditto upon this original project were intended to effectively measure the transactional distance felt by the student on both a student-to-student basis and a student to teacher basis. The survey created by Drew Ditto was a result of organizing and analyzing surveys filled out by students taking distance learning Computer Science courses. His measurements will not be used very intensively, because of the fact that his measurements were based upon measuring student-to-student transactional distance. However, his methods were a springboard for this IQP's measurement methodology.

3.1.3 Data Collection

The data was taken from surveys filled out by each student and sent in along with their weekly course assignment. These surveys are collected in "Modules", and each Module is roughly measured by a week of class time. The surveys are divided by three different classes; CS 503, or Foundations of Computer Science, CS 525, or Adaptive Web Technology, and CS 544, Compiler Construction. In one of the three classes, Compiler Construction, a majority of the students will be taking the class out of Katmandu University in Nepal. Because these students are so far from WPI, where the class is based from, the measurements taken from their survey will give the end results a concise measurement of the emotional distance felt by the students from the professor.

3.1.4 Data Measurement and Scaling

The analysis section of this IQP is the general measurement of the transactional distance or the general emotional gap felt between the students and the professor. The individual answers provided by the students are used and scaled from “Highest Transactional Distance” to “Lowest Transactional Distance”. In some instances, the answers provided did not give to either category, and in this case, those answers will be assigned with no scale, so that it does not add to the end rating. Each student’s rating was analyzed along the course of the class. Because the data provided is so intangible, the most effective qualitative measurement available would be to scale the answers from negative, or low levels of transactional distance, to higher, positive levels of transactional distance. One of the end targets of this scaling was to see if the student’s transactional distance value is within the average range. For each of the questions, the average scaled value should be between 0 and 1, 0 generally denoting “middle of the road” level of transactional distance, and 1 generally denoting a value just above that “middle of the road level. Therefore, the average values for each student should have been between 0 and 1 for each question. Since there are only 17 qualitatively measurable questions in each survey, the average value for each of the student’s module values should have been between 0 and 17, more specifically, around the midpoint of 8 units.

3.2 Incorporating Subjective Individual Comments

Along with measurable questions and answers, each survey allotted the student the ability to speak directly to the surveyor, and voice opinion about that module. This option has a different function for the student than the normal bulletin board. The every day function of the bulletin board would let students interact with the professors, teaching

assistants, or the other students. The bulletin board allowed free discussion about the material, and individual assignments.

However, when faced with issues that normally cannot be discussed to a solution, the survey gave the students an outlet by which to further thrash out issues or problems. The survey let the student to speak about issues with the module, or the lectures. Unlike the bulletin board, these answers were not seen by the other students, thus were unable to be discussed upon.

Comparing these subjective answers and opinions alongside individuals with high or low levels of transactional distance gives these measurements another dimension. A student's transactional distance, whether high or low, can then be explained by the student's individual survey comments.

3.3 New Survey Implementation

Because the most difficult part of measuring each student's transactional distance will be applying the most appropriate scale, the new survey created was designed so that the answers are built in with a pre-existing scale. The student will assign his or her own level of transactional distance along a numerical scale. Asking the student outright to measure how much contact he or she had with the professor or the other students will document the data when it is most fresh and full-bodied. Scaling the survey after the student has taken the survey and fulfilled that week's module will lose some of the data integral to measuring transactional distance.

4.0 Results

This project's primary objective was to measure the emotional transactional distance sensed by students taking online distance learning courses. This objective works towards the goal of determining whether it could be said that high level of transactional distance hinders a student's ability to learn. Analyzing the results from surveys taken after academic modules, and the subjective opinions gathered from these surveys gathered together the qualitative and quantitative data needed in order to construct these measurements.

4.1 Measuring Transactional Distance

The results were compiled weekly after each module, along with each student's homework. Each student's answer was assigned along a scale, which would then be compiled with all the other answers, in order to construct a general scaled measurement of the student's perceived distance from the teacher, or his or her transactional distance.

For example, one question, question 4,

“Did you post on the Bulletin Board?”

The two answers available to the student are “Yes”, and “No”. In this example, if the student posed on the bulletin board, they allowed for a higher interaction and dialogue with the instructor. As discussed before in Saba's extended theory, it believed that as the amount of dialogue increases, the transactional, or emotional distance then decreases.

Therefore, the answer “Yes” will be scaled with a “1”. The answer of “no” then means that the student did not partake in discussion with the other students and the professor; thus increasing his or her transactional distance. The answer of “no” is denoted with “-1” scale.

Therefore, the higher the scale, then the student perceived a lower level of transactional distance. An example set of transactional distance scales is shown in the chart below for the CS 525 course, Adaptive Web Technology.

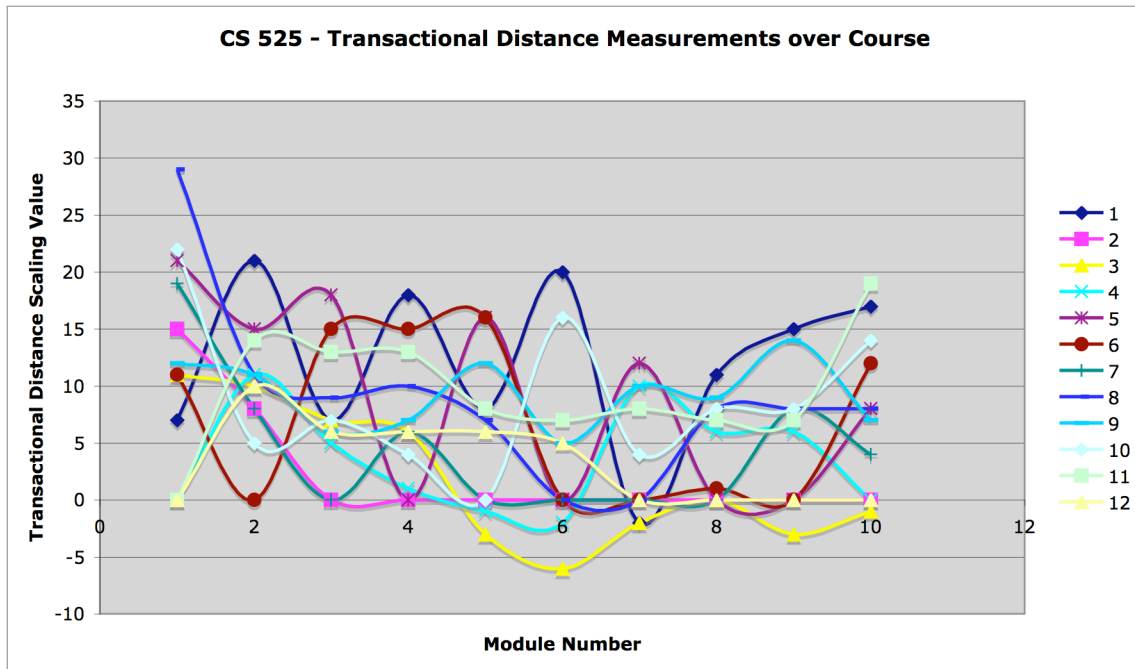


Figure 1 - CS 525 Transactional Distance Measurements Over Course

As shown in the graph in Figure 1, each of the lines represents one student's scaled transactional distance for the entirety of the course. In this instance, the course was CS 525, or Adaptive Web Technology.

Rather than analyzing the transactional distance averages, however, accomplishing the goal of determining whether or not the perceived distance hinders a student's learning experience, individual trends must be analyzed. The subjective information provided with the survey will then allow for qualitative analysis of this question.

4.2 Incorporation of Individual Subjective Comments

As shown below, the average perceived distance for all the surveys started relatively high, and then balanced off between 5.5 and 7.5. Some reasons for a high value for the first module are high survey submission, and a lower average survey submission for the following module.

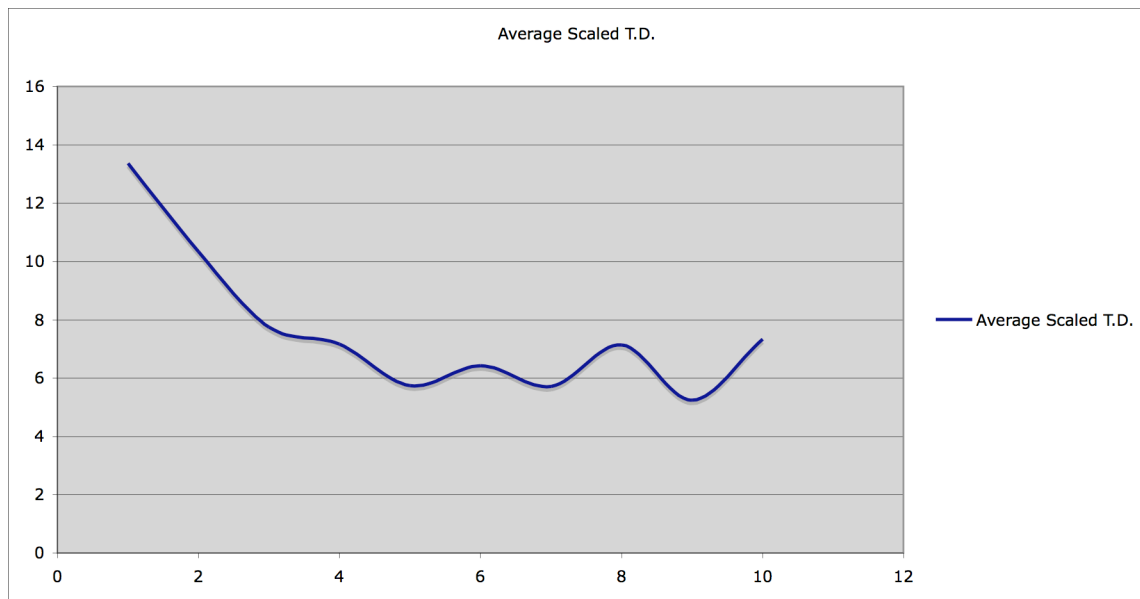


Figure 2 – Average Scaled Transactional Distance

Taking outliers from this average, whether they show high perceived distance, or low perceived distance, and inspecting their survey comments will explain and further evaluate one of the objectives of this IQP.

4.2.1 Example Student 1

One example student is “Example Student 1”, and the values from his modules are shown below.

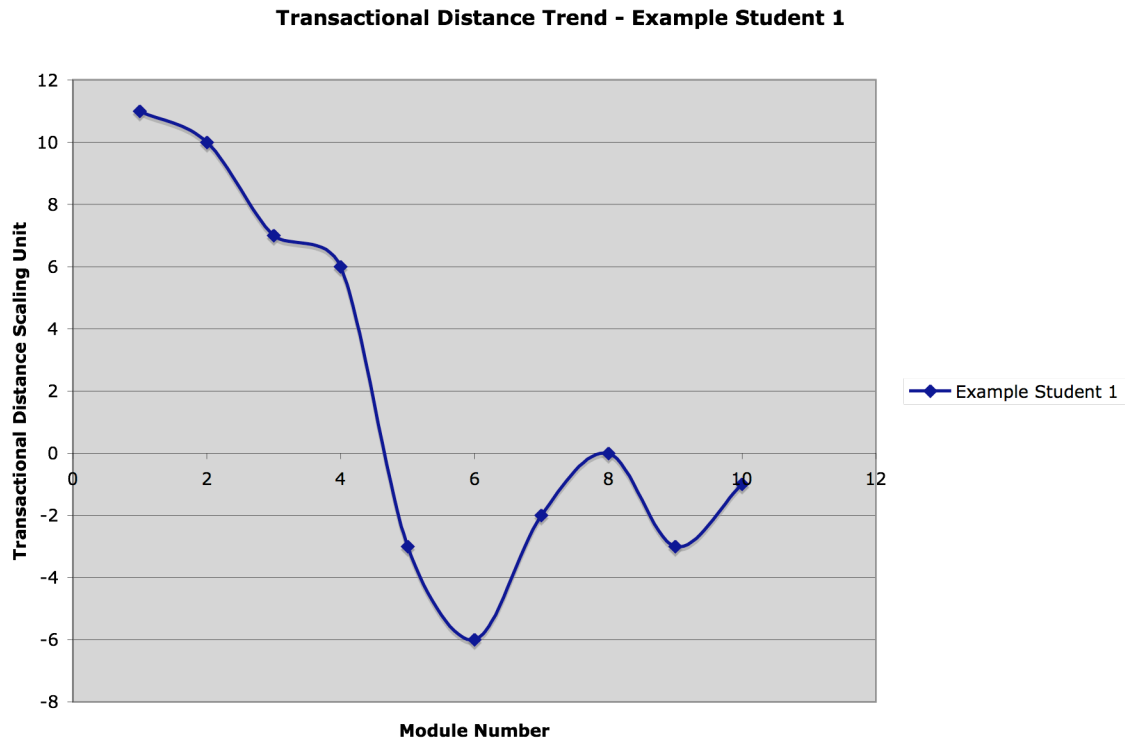


Figure 3 - Example Student 1

As shown, all but two of his modules show a generally high, or low transactional distance. Two particularly high and low outliers are seen in module 2a and 5. In this survey, the student commented highly on his misunderstanding of the material. In the survey, he said that he “thought the second part of the assignment was confusing and did not understand the deliverables required.” (Example Student 1, 2006) Considering that in this module, his perceived distance scored a -6, a correlation can be seen between the high transactional distance, and the level of ability, or understanding the student has of the module. This correlation is further proved by his answer of “none” to the question of how much contact he has with the professor, TA, or other course staff.

Another example outlier module is module 1. For this module, the student averaged very low levels of perceived distance for each of the answers of the survey. For

the units used in this study, he scored very highly, which translated to a lower transactional distance.

For this module, the student generally had much more contact than the other module. Also, he spoke of many outside sources he contacted for help for the work for this module. These factors would then speak for the low perceived distance from the teaching staff.

4.2.2 Example Student 2

In order to further prove the correlation between a students' ability to complete the requirements for an assignment or class and his or her transactional distance, another student's set of surveys will be intensively examined. For this example, D. Tran will be used, a student in the CS 503, Foundations of Computer Science class. Below is a graph of the trend of his perceived distance from the teaching staff, as measured by his survey answers.

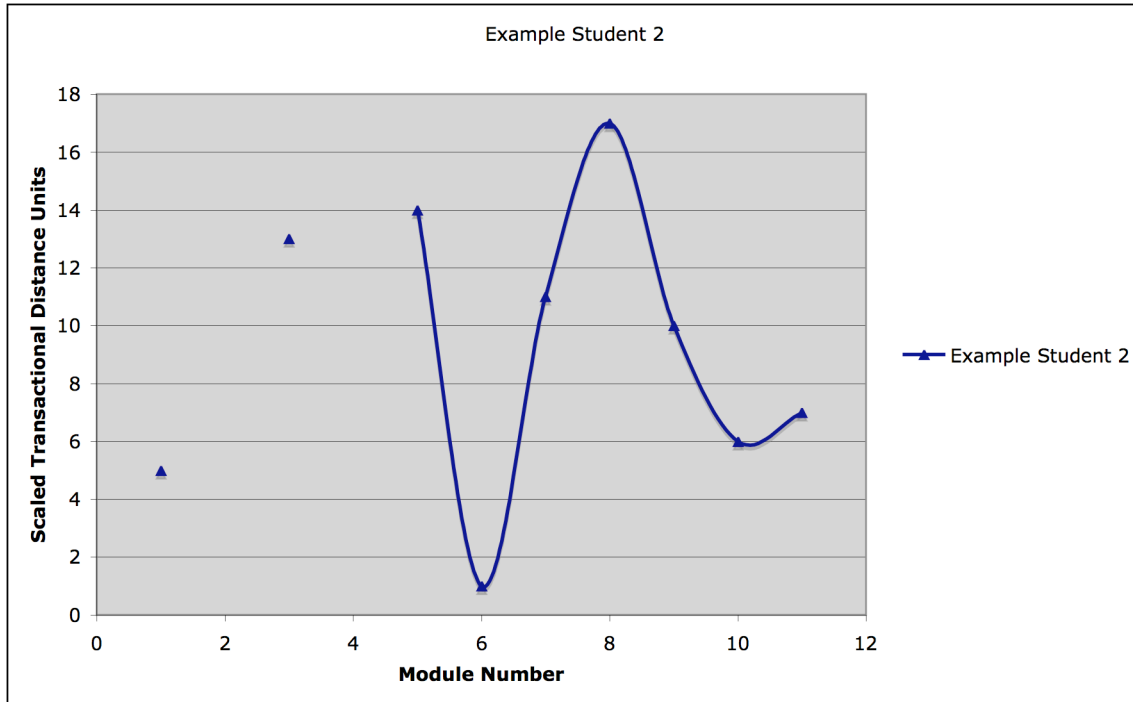


Figure 4 - Example Student 2

Again, like the first student analyzed, all but one of this student’s transactional distance values is outside of the average range. (The first two points are not connected to the rest because the surveys for modules 2 and 4 were not filled out.) The lowest recorded level of transactional distance scaling units was for module 6, at 1 unit. Since this denotes a higher emotional distance from the teaching staff, the discussed correlation can be assessed through the comments attached to the survey. In this survey, the student proclaimed that he “wished there was more material on showing how to prove things out. Proofs were the part that I was struggling with.” (Example Student 2, 2006) This corresponds with the idea that a higher transactional distance can hinder a student’s ability to perform well academically for an assignment, or in this case, module. Conversely, for the module that the student scored highest in transactional distance scaling units, the student also had the highest amount of contact with the teaching staff

and other students. This is in contrast to the other module in which the student had no contact with the teaching staff or other students.

4.3 New Survey Implementation

Further analyzing the goal using transactional distance ratings and subjective comments made by the students allowed for an insight into problems inherent to the survey provided. These problems were addressed through recommendations made in order to make future survey results more effective.

4.3.1 New Survey Organization

Since the ideas provided earlier in this IQP suggest a correlation between a student's ability to fare well in assignments and lectures, and the student's relative low level of transactional distance, the new survey organization should then reflect that. The questions that give the student's survey an objective voice should be reorganize to direct the student's answers in the way of explaining his or her ability or disability to complete the assignment.

4.3.2 Comments and Opinions

Since the question isn't whether or not the assignment was easy or difficult, this parameter cannot be measured by a simple multiple-choice question. Therefore, the change to the survey will then be to reform the question

“What other questions do you wish I had asked|?”

to

“How do you feel the fact that this is a distance learning course changed your ability to complete your assignment?”

This question directs the student in the way of answering the question, how would this class be different if you were sitting in class, directly speaking to the teacher everyday? In most cases, since it is perceived that the transactional distance in a live action class, although existent, is very low, that situation could be used as litmus to judge how effective the class was, in the student's eyes. Therefore, the student is basically explaining how it would be different than if he or she were sitting in class daily.

4.3.3 Pre-Existing Scaling

Since the basic significance of the survey is to measure the transactional distance perceived for this distance learning class, it would make the end answers much heartier if the student were to scale his or her own answer. For example, for questions 7 through 12, the student is to pick from "some", "a little", "none", and "a lot". This process could prove confusing for the student in two ways. Either the difference between "some" and "a little" is indecipherable, or, the amount cannot be easily measured by one of these four gauges. Therefore, the student should be able to scale his or her answer from 0-5, 0 meaning no contact, or high transactional or perceived distance, and 5 meaning the highest level of contact, or low transactional distance. This will also lessen the degree of error created when the student's answers are transferred along the surveyor's scale. (For New Survey, see Appendix D.)

5.0 Recommendations

One of the major issues in measuring these trends was that many of the important data points were missing. For some students, a majority of the surveys were filled out, however, the ones that weren't filled out in some cases knocked data points out of trend lines, thus lending itself to a less strong correlation. Therefore, any future improvements should involve trying to get 100% participation for the student participation surveys.

6.0 Conclusion

This IQP's specific goal was to answer the question; how does a student's perceived transactional distance obstruct his or her ability to understand the material in a distance-learning environment? To reach this goal, certain objectives had to be fulfilled. The first of these objectives was to quantitatively and qualitatively measure the transactional distance perceived by each student in three different distance learning graduate level computer science courses. This perceived distance, or his or her transactional distance, is defined by Michael Moore's theory as the "cognitive space between learning peers, teachers and content in a distance education setting." (Moore and Kearsley, 2004) The students in these three classes; "Foundations of Computer Science", "Adaptive Web Technology", and "Compiler Construction", were required to fill out surveys about their learning experience following each week, or module. Measuring the transactional distance perceived by each student fulfilled this objective. The second objective of this IQP was to incorporate the subjective information from each of these surveys, and to attempt to qualitatively answer the question supplied in the goal. Tying together this data with the transactional distance scales for each student fulfilled the end goal of this IQP.

References

Cheaney, James and Thomas S. Ingebritsen "Problem-based Learning in an Online Course: A case study" The International Review of Research in Open and Distance Learning November 2005, Iowa State University 1 June 2006 <<http://www.irrodl.org/index.php/irrodl/article/view/267/433>>

Choi, Hee Jun and Scott D. Johnson "The Effect of Context-Based Video Instruction on Learning and Motivation in Online Courses" The American Journal of Distance Education p 215-227 2005 Lawrence Erlbaum Associates, Inc., 30 May 2006 http://www.leaonline.com/doi/pdf/10.1207/s15389286ajde1904_3

Ditto, Drew Measuring Transactional Distance in Web Based Environments WPI IQP, 2005

Dron, Jon, "A Loophole in Moore's Law of Transactional Distance," *icalt*, pp. 41-45, Fourth IEEE International Conference on Advanced Learning Technologies 2004 (ICALT'04)

Hult, A., Dahlgren, E., Hamilton, D., & Söderström, T. "Teachers' Invisible Presence in Net-based Distance Education" The International Review of Research in Open and Distance Learning 2006 Feb 16 Pedagogiska institutionen, Umeå Universitet, Sweden Pedagogiska institutionen, Umeå Universitet, Sweden 31 May 2006 <<http://www.irrodl.org/index.php/irrodl/article/view/262/405>>

Gibson, Chere Campbell Distance Learners in Higher Education: Institutional Responses for Quality Outcomes Madison, WI: Atwood Publishing Company 1998

Moore, M. G., & Kearsley, G. Distance education: A Systems View. Belmont, CA: Wadsworth Publishing Company July 2004

Palloff, Rena M., and Keith Pratt The Virtual Student: A Profile and Guide to Working with Online Learners San Francisco, CA: Jossey-Bass 2003

Appendix A: Annotated Bibliography

Cheaney, James and Thomas S. Ingebritsen “Problem-based Learning in an Online Course: A case study” The International Review of Research in Open and Distance Learning November 2005, Iowa State University 1 June 2006 <
<http://www.irrodl.org/index.php/irrodl/article/view/267/433>>

This is a case study that is comparable to that of this project. It introduces the idea of “Problem Based Learning” in a distance learning environment.

Choi, Hee Jun and Scott D. Johnson “The Effect of Context-Based Video Instruction on Learning and Motivation in Online Courses” The American Journal of Distance Education p 215-227 2005 Lawrence Erlbaum Associates, Inc., 30 May 2006
http://www.leaonline.com/doi/pdf/10.1207/s15389286ajde1904_3

This article lead the to Saba and Shearer argument that as dialogue increases, transactional distance decreases. This idea was used as a basis for the goal question.

Ditto, Drew Measuring Transactional Distance in Web Based Environments WPI IQP, 2005

This was the previous project report written by Drew Ditto. The survey questions and initial survey questions were taken directly.

Dron, Jon, "A Loophole in Moore's Law of Transactional Distance," *icalt*, pp. 41-45, Fourth IEEE International Conference on Advanced Learning Technologies 2004 (ICALT'04)

This study allowed for the extension of Moore's Law, therefore allowing for the involvement of the Saba and Shearer theory.

Hult, A., Dahlgren, E., Hamilton, D., & Söderström, T. "Teachers' Invisible Presence in Net-based Distance Education" The International Review of Research in Open and Distance Learning 2006 Feb 16 Pedagogiska institutionen, Umeå Universitet, Sweden Pedagogiska institutionen, Umeå Universitet, Sweden 31 May 2006
<<http://www.irrodl.org/index.php/irrodl/article/view/262/405>>

This study introduces the idea of a high student to teacher transactional distance. It was used to evaluate the new survey in such a direction.

Gibson, Chere Campbell Distance Learners in Higher Education: Institutional Responses for Quality Outcomes Madison, WI: Atwood Publishing Company 1998

This was a study about college distance learning classes.

Moore, M. G., & Kearsley, G. Distance education: A Systems View. Belmont, CA: Wadsworth Publishing Company July 2004

This was a study written by Moore and Kearsley with an updated view of Transactional Distance.

Palloff, Rena M., and Keith Pratt The Virtual Student: A Profile and Guide to Working with Online Learners San Francisco, CA: Jossey-Bass 2003

This is a study of how to work with distance learning students. It was used for primarily background information.

Appendix B: Initial Survey: Paula Quinn and Professor Karen Lemone, Collaborators

CS 503 Module <Insert Module Number> Survey

Do not do this assessment until you are completely done with Module 10 including having submitted the homework and looked at (and listened to) the ppt solutions

Part 1

Teaching Technology Fellowship evaluation measures the effects course improvements (animation, audio, video) have on students

1. Demographics

There are **2** questions to answer.

1. Your name:

2. Are you:

From WPI

From KU

2. Course Improvements

There are **6** questions to answer.

1. How many times did you go back to Module 0 and access the Animation of Mathematical Induction?

0

1

2

More than 2

2. How many times did you access the ppt homework solutions?

0 (Then do not do the survey yet)

1

2

More than 2

3. How would you rate the video quality of the ppt Animation?

very poor

poor

neither poor nor good

good

very good

4. How would you rate the audio quality of the ppt Animation?

very poor

poor

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neither poor nor good

good

very good

5. How useful were the ppt homework solutions in helping you to understand

the material better?

- not at all useful
 - not very useful
 - neither not useful nor useful
 - useful
 - very useful
6. How useful was the audio in the ppt homework solutions?
- not at all helpful
 - not very helpful
 - neither not helpful nor helpful
 - helpful
 - very helpful

Part 2

Transactional Distance measures the psychological distance students experience with other students, the instructors, the content and the interface.

There are **21** questions to answer.

1. How much time did you spend on Module 10?

- Less than 3 hours
- 3-5 hours
- 6-10 hours
- 11-15 hours
- 16-20 hours
- 20+ hours

2. How helpful was the course staff in answering your questions on the bb for this module ?

- not at all helpful
- not very helpful
- did not have any questions
- helpful
- very helpful

3. How much contact online did you have with fellow class members ?

- none
- a little
- a lot

4. Did you post to the bb?

- yes
- no

5. Did you answer a question or reply to someone on the bb?

- yes

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- no
- there was nothing to reply to

6. How helpful was the chat room session?
- not at all helpful
 - not very helpful
 - did not have a chat room session or unable to attend
 - helpful
 - very helpful
7. How helpful was the background reading?
- not at all helpful
 - not very helpful
 - either not helpful nor helpful
 - helpful
 - very helpful
8. Did you search the web for supplementary material?
- yes
 - no
9. How helpful were the bb postings?
- not at all helpful
 - not very helpful
 - neither not helpful nor helpful
 - helpful
 - very helpful
 - did not read the bb
10. How many times did you access the bb?
- 0
 - 1
 - 2
 - More than 2
11. How many times did you enter the chat room?
- 0
 - 1
 - 2
 - More than 2
12. How many times did you access your grades?
- 0
 - 1
 - 2
 - More than 2
13. How many times did you access the background reading?
- 0
 - 1
 - 2
 - More than 2
14. How many times did you use the File Exchange?

0

39

1

2

More than 2

15. The material in the module was:

very difficult

difficult

neither difficult nor easy

easy

very easy

16. Did you have enough time for this module?

yes

no

17. Did you need to talk to a live person (besides a classmate) face-to-face in order to do this Module?

yes

no

18. Where can you access the course site from? (Check all that apply)

from school

from home

from work

from a friends

from an internet cafe

others

19. If others, please specify:

20. What question(s) do you wish I had asked?

21. Other comments (Please do not hesitate!)

40

Appendix C: Second Stage Survey: Completed by Drew Ditto, 2005

Revised Survey

Part 1

General questions to measure course effectiveness and areas that need improvement.

22. How much time did you spend on Module 10?

- Less than 3 hours
- 3-5 hours
- 6-10 hours
- 11-15 hours
- 16-20 hours
- 20+ hours

23. How helpful was the course staff in answering your questions for this module ?

- did not have any questions
- not at all helpful
- not very helpful
- helpful
- very helpful

24. Did you post to the bb?

- yes
- no

25. Did you answer a question or reply to someone on the bb?

- yes
- no
- there was nothing to reply to

26. How helpful was the chat room session?

- not at all helpful
- not very helpful
- did not have a chat room session or unable to attend
- helpful
- very helpful

27. How helpful was the background reading?

- not at all helpful
- not very helpful
- either not helpful nor helpful
- helpful
- very helpful

28. Did you search the web for supplementary material?

- yes
- no

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29. The material in the module was:

- very difficult
- difficult
- neither difficult nor easy
- easy
- very easy

30. Did you have enough time for this module?

- yes
- no

31. Did you need to talk to a live person (besides a classmate) face-to-face in order to do this Module?

- yes
- no

32. What question(s) do you wish I had asked?

33. Other comments (Please do not hesitate!)

Part 2

Questions geared towards the evaluation of Transactional Distance for this module.

7. How much contact did you have with the Professor(s) or TA(s), and other Course Staff?

- None
- A Little
- Some
- A Lot

8. In your opinion, how much contact, online or otherwise, did you have with fellow class members?

- None
- A Little
- Some
- A Lot

9. How much did you access the BB?

- None
- A Little

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- Some
- A Lot

10. How much time did you spend with the Course Management System?

- None
- A Little
- Some

A Lot

11. How much time did you spend preparing for assessments (Homework, tests)?

None

A Little

Some

A Lot

12. What level of understanding did you take from the course material?

None

A Little

Some

A Lot

Appendix D: Third Stage Survey: Completed by Laura Bennett, 2007

Revised Survey

Part 1

General questions to measure course effectiveness and areas that need improvement.

22. How much time did you spend on Module 10?

- Less than 3 hours
- 3-5 hours
- 6-10 hours
- 11-15 hours
- 16-20 hours
- 20+ hours

23. How helpful was the course staff in answering your questions for this module ?

- did not have any questions
- not at all helpful
- not very helpful
- helpful
- very helpful

24. Did you post to the bb?

- yes
- no

25. Did you answer a question or reply to someone on the bb?

- yes
- no
- there was nothing to reply to

26. How helpful was the chat room session?

- not at all helpful
- not very helpful
- did not have a chat room session or unable to attend
- helpful
- very helpful

27. How helpful was the background reading?

- not at all helpful
- not very helpful
- either not helpful nor helpful
- helpful
- very helpful

28. Did you search the web for supplementary material?

- yes
- no

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29. The material in the module was:

- very difficult
- difficult
- neither difficult nor easy
- easy
- very easy

30. Did you have enough time for this module?

- yes
- no

31. Did you need to talk to a live person (besides a classmate) face-to-face in order to do this Module?

- yes
- no

32. How do you feel the fact that this is a distance-learning course changed your ability to complete your assignment?

33. Other comments (Please do not hesitate!)

Part 2

Questions geared towards the evaluation of Transactional Distance for this module.

7. How much contact did you have with the Professor(s) or TA(s), and other Course Staff?

(NOTE: 0 denotes no contact, 1 denotes the least amount of contact, 5 denotes the most amount of contact.)

0 1 2 3 4 5

8. In your opinion, how much contact, online or otherwise, did you have with fellow class members?

0 1 2 3 4 5

9. How much did you access the BB?

0 1 2 3 4 5

10. How much time did you spend with the Course Management System?

0 1 2 3 4 5

11. How much time did you spend preparing for assessments (Homework, tests)?

0 1 2 3 4 5

Appendix E – Survey Results

CS 503:

Module	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
0																				
1	1	1	1	4	0	1	0	0	1	1	0	1	-1	1	-1	2	1	3	2	
2	0	0	0	2	0	1	0	0	1	-1	1	1	-1	-1	1	-1	-1	3	2	
3	2	2	2	2	0	1	0	0	1	-1	1	1	-1	1	-1	1	2	-1	2	
Module 1																				
				6-																
1	0	1	1	10	2	1	1	0	1	1	0	1	-1	1	2	3	2	3	3	
Module 2																				
				6-		-	-													
4	0	0	0	10	0	1	1	0	0	-1	1	1	-1	-1	2	3	3	3	2	
2	0	0	0	<3	1	1	1	0	1	-1	1	1	-1	1	1	1	1	2	3	
				6-		-	-													
5	>2	1	1	10	0	1	1	0	1	1	0	1	-1	-1	-1	2	1	2	2	
						-	-													
6	0	1	0	3-5	1	1	0	1	0	1	0	1	-1	-1	2	2	1	2	2	
						-	-													
7	0	1	1	<3	0	1	1	1	1	1	1	1	-1	-1	-1	1	1	1	3	
						-	-													
3	0	2	2	3-5	1	1	1	0	1	1	0	1	-1	1	2	2	2	3	3	
				6-		-	-													
1	0	1	1	10	1	1	1	0	1	1	1	1	-1	1	1	2	1	1	3	
						-	-													
7	0	1	1	3-5	0	1	1	0	1	1	0	1	-1	-1	-1	-1	1	2	3	
Module 3																				
3	1	0	3-5	1	1	1	0	1	1	-1	1	-1	1	2	2	2	3	2		
			6-		-	-														
4	0	1	10	0	1	1	0	2	1	1	1	-1	-1	-1	2	2	2	2		
					-	-														
7	1	1	<3	0	1	1	1	1	-1	1	1	-1	1	-1	1	1	1	3		
					-	-														
6	0	0	<3	0	1	1	0	1	1	1	1	-1	-1	2	3	1	1	2		
					-	-														
5	0	0	3-5	0	1	1	0	0	1	0	1	-1	-1	-1	1	1	1	2		
					-	-														
8	0	0	3-5	1	1	1	0	2	-1	0	1	-1	1	1	2	1	2	2		
			6-		-	-														
7	1	0	10	0	1	1	1	1	1	-2	1	-1	-1	-1	2	1	2	2		
Module 4																				
2	0	0	3-5	1	1	1	0	0	1	-1	1	-1	2	2	3	-1	3	2		
					-	-														
5	1	1	3-5	1	1	1	0	1	1	0	1	-1	2	-1	2	1	1	2		
			6-		-	-														
6	1	0	10	1	1	1	0	1	-1	-1	1	-1	-1	2	3	2	3	2		
			11-		-	-														
3	1	1	15	1	1	1	0	2	1	-2	1	-1	2	2	3	3	3	2		
			6-		0	1	-	0	1	1	-1	1	1	-1	-1	2	3	3	3	
4	0	1	6-	0	1	-	0	1	1	-1	1	1	-1	-1	2	3	3	3		

			10		1													
8	0	0	6-10	1	1	1	0	1	1	-1	-1	-1	1	1	2	2	1	2
7	0	1	6-10	0	1	1	1	0	1	1	1	-1	-1	-1	2	2	2	3
Module 5																		
2	0	0	<3	0	1	1	0	1	-1	1	1	-1	-1	-1	1	-1	1	3
6	1	1	3-5	0	1	1	0	0	-1	0	1	-1	-1	1	3	1	2	3
5	0	0	6-10	0	1	0	0	1	1	-1	1	-1	1	-1	1	1	2	2
4	0	1	6-10	0	1	1	0	2	1	0	1	-1	-1	-1	2	2	2	3
9	2	0	3-5	0	1	1	1	1	1	1	-1	-1	-1	-1	1	1	2	3
7	1	1	11-15	0	1	1	1	1	1	-2	-1	-1	-1	1	2	2	2	2
Module 6																		
2	0	0	3-5	1	1	1	0	1	1	-1	1	-1	2	-1	2	1	3	2
5	0	0	3-5	1	1	1	0	1	1	0	1	-1	2	1	2	2	2	2
6	0	1	6-10	0	1	1	0	0	1	-2	1	-1	-1	-1	3	1	2	2
4	0	1	6-10	0	1	1	0	2	1	0	1	-1	-1	-1	2	2	2	2
Module 7																		
4	0	0	3-5	1	1	1	0	1	1	0	1	-1	2	2	2	1	2	3
4	0	0	6-10	0	1	1	0	2	1	0	1	-1	-1	3	3	2	2	2
5	0	0	6-10	0	1	1	0	1	1	-1	1	-1	3	-1	1	1	1	1
Module 8																		
3	0	0	3-5	1	1	1	0	1	1	0	1	-1	1	-1	2	1	2	2
4	1	0	11-15	0	1	1	0	2	1	-1	-1	-1	-1	-1	2	2	2	2
9	2	0	6-10	0	1	1	1	2	1	0	-1	-1	2	2	2	2	2	3
6	1	0	6-10	0	1	1	0	0	1	-1	1	-1	-1	-1	3	1	1	2
Module 9																		
3	0	0	6-10	0	1	1	0	1	1	-1	1	-1	-1	-1	2	1	2	2
5	0	0	6-10	0	1	1	0	1	1	-1	1	-1	2	-1	2	1	2	1
6	0	0	6-10	0	1	1	0	0	1	-1	1	-1	-1	-1	3	2	2	1
0	2	2	11-15	2	1	1	1	2	1	-1	-1	-1	2	1	2	2	2	3

**Module
10**

5	0	0	3-5	1	-	-	0	1	1	1	1	-1	1	-1	2	1	1	2
3	0	0	6- 10	0	1	1	0	0	1	-1	1	1	-1	-1	2	1	2	2

CS 544:
Module

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1	4	1	1	1	0	1	1	0	1	-1	2	1	2	2	3	3
2	1	4	0	1	1	0	1	1	0	1	-1	-1	2	2	2	2	3
3	0	8	1	1	1	1	2	1	0	1	1	1	2	-1	3	3	2
4	0	8	1	1	1	1	2	1	0	1	1	2	3	2	2	3	3
5	0	8	1	1	1	1	2	1	0	1	1	2	2	2	3	3	2
6	0	4	0	1	1	0	1	1	1	1	-1	1	2	-1	2	3	2
7	0	13	1	1	1	2	1	1	0	1	1	1	2	3	3	3	2
8	0	8	1	1	1	1	1	1	0	-1	1	1	2	1	3	2	2
9	0	2	0	1	1	0	1	1	0	1	-1	-1	2	1	2	2	2
10	1	8	1	1	1	0	1	1	0	1	-1	1	-1	3	3	3	2
11	0	4	1	1	1	0	1	1	1	1	-1	1	2	2	2	3	2
12	1	8	1	1	1	0	1	1	1	-1	-1	1	1	2	2	2	2
13	0	8	1	1	1	0	1	1	0	1	1	1	3	1	2	2	2
14	0	8	1	1	1	0	1	1	0	1	1	2	1	1	2	2	3
15	0	8	1	1	1	0	2	1	0	1	-1	2	1	2	2	3	2
16	0	4	1	1	1	0	2	1	0	1	1	2	3	3	2	3	3
17	0	18	1	1	1	0	1	1	1	-1	-1	1	2	3	2	3	2
18	1	13	0	1	1	0	1	1	0	1	-1	1	1	1	1	2	2
19	0	4	1	1	1	0	1	1	0	1	-1	2	3	2	2	2	2
20	1	4	1	1	1	0	1	1	0	1	-1	-1	2	2	2	2	3
21	0	4	2	1	1	0	1	1	0	1	1	1	2	1	1	3	3
22	0	2	0	1	1	0	1	1	1	1	-1	1	2	2	2	2	3
23	0	4	0	1	1	0	1	1	1	1	1	1	1	1	2	1	2
24	0	8	0	1	1	0	2	1	0	1	-1	2	2	2	1	3	3
25	0	4	2	1	1	0	1	1	0	1	-1	1	1	1	-1	3	2
26	0	8	0	1	1	0	2	1	1	1	-1	2	3	2	3	2	2
27	0	4	2	1	1	0	1	1	0	1	-1	1	2	-1	-1	3	2
28	0	8	0	1	1	2	1	1	1	1	-1	2	1	3	2	3	3

29	0	4	0	1	1	0	1	1	0	1	-1	2	3	2	2	2	2
30	0	8	0	1	1	1	2	1	0	1	-1	3	3	3	3	3	3
31	0	13	1	1	1	1	1	1	1	1	-1	2	2	1	2	3	2
32	0	4	0	1	1	0	1	1	0	1	-1	2	2	1	1	2	2
33	0	8	1	1	1	2	2	1	0	1	-1	1	2	2	2	2	3
34	0	4	2	1	1	1	1	1	0	1	-1	1	1	-1	2	2	2
35	0	13	0	1	1	1	1	1	0	1	-1	1	1	2	3	3	2
36	0	4	0	1	1	2	1	1	0	1	-1	1	2	3	1	2	2
37	0	2	0	1	1	2	1	1	0	1	-1	1	2	3	1	2	2
38	0	13	0	1	1	2	1	1	0	1	-1	1	3	3	2	3	2
39	0	18	1	1	1	0	1	1	0	-1	1	1	2	3	1	3	2
40	0	4	2	1	0	1	2	1	0	1	-1	2	3	2	3	1	3
41	0	4	0	1	1	1	2	1	1	1	-1	3	3	3	3	3	3
42	0	2	1	1	1	0	1	1	1	1	-1	-1	-1	1	1	2	2
43	0	4	1	1	1	0	1	1	0	-1	1	1	2	-1	2	2	2
44	0	8	1	1	1	1	2	1	0	1	-1	2	2	2	1	2	2
45	0	4	0	1	1	1	1	1	0	-1	1	1	2	-1	2	3	2
46	0	4	0	1	1	0	1	1	0	1	-1	1	-1	1	1	2	2
47	0	4	0	1	1	0	1	1	0	1	-1	1	1	1	2	1	2
48	0	4	0	1	1	0	0	1	1	1	-1	1	2	2	3	3	1
49	0	8	1	1	1	1	1	1	1	-1	-1	2	-1	2	1	3	3
50	0	8	1	1	1	1	1	1	1	-1	-1	1	-1	2	1	3	3
51	0	4	1	1	0	0	0	1	0	1	-1	1	3	2	2	2	2
52	0	8	1	1	1	2	1	1	0	1	-1	1	2	3	2	3	2
53	0	4	0	1	1	0	1	1	1	-1	1	2	3	3	2	2	2
54	1	8	0	1	1	0	2	1	0	1	-1	1	1	2	2	2	1
55	0	4	1	1	1	0	1	1	0	1	1	2	3	2	1	2	2
56	0	8	1	1	1	0	1	1	0	-1	-1	2	1	2	2	2	2
57	0	4	1	1	1	0	1	1	0	1	1	2	2	2	2	2	2

58	0	8	2	-	-	-	1	1	0	-1	1	1	2	2	2	2	2
59	0	20	1	-	-	-	1	1	0	1	-1	2	2	3	3	3	2
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Module

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**Module
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71	1	13	1	1	1	0	1	1	1	1	-1	2	2	2	2	2	3
			-	-	-			-									
14	1	8	0	1	1	0	1	1	0	1	-1	2	2	3	3	3	3

**Module
6**

			-					-									
2	1	2	0	1	0	0	1	1	1	1	-1	-1	-1	1	1	1	3
			-	-	-			-									
21	1	13	0	1	0	0	2	1	1	1	-1	1	1	3	1	3	2
			-	-	-			-									
16	1	13	0	1	1	0	1	1	0	1	-1	-1	-1	3	2	2	2
			-	-	-			-									
71	1	4	0	1	1	0	2	1	1	1	-1	-1	-1	-1	1	3	3
			-	-	-			-									
39	1	4	0	1	1	1	1	1	0	1	-1	-1	-1	2	3	2	3
			-	-	-			-									
14	1	4	0	1	1	0	2	1	0	1	1	-1	1	-1	1	2	2
			-	-	-			-									
4	1	13	1	1	1	0	1	1	1	1	-1	2	2	2	2	2	2
			-	-	-			-									
25	1	4	0	1	1	0	1	1	1	1	-1	-1	-1	1	1	1	2
46	1	8	0	1	1	0	1	1	0	1	-1	1	2	2	-1	3	3
			-	-	-			-									
35	1	4	0	1	0	0	1	1	1	1	-1	1	2	3	3	2	3
63	1	4	0	-	0	0	1	-	1	1	-1	-1	1	-1	-1	-1	2

32	1	8	0	1	1	0	1	1	0	1	-1	1	1	2	1	2	3
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**Module
7**

63	1	8	1	1	1	0	1	1	1	1	-1	2	-1	-1	1	2	2
2	1	8	1	1	1	0	2	1	0	1	-1	1	-1	2	2	2	3
71	1	13	1	1	1	0	2	1	1	1	-1	2	1	3	1	3	2
25	1	4	0	1	1	0	1	1	1	1	-1	-1	-1	-1	1	2	2
32	1	8	0	1	1	0	1	1	0	1	-1	1	2	3	3	3	3
39	1	13	1	1	1	0	1	1	1	1	-1	2	2	2	2	2	2
21	1	8	0	1	1	0	2	1	1	1	-1	-1	1	2	2	2	2
35	1	2	0	1	1	0	1	1	1	1	-1	-1	1	2	1	-1	2
14	1	8	1	1	1	0	1	1	1	1	-1	2	1	2	1	3	2
5	1	13	0	1	1	0	1	1	1	1	-1	2	2	2	2	2	2
4	1	2	0	1	1	0	1	1	0	1	-1	-1	-1	1	1	1	2

**Module
8**

71	1	4	1	1	1	0	1	1	1	1	-1	1	-1	-1	1	1	2
39	1	8	0	1	1	0	2	1	0	1	-1	1	-1	3	2	2	3
4	1	8	1	1	1	0	2	1	1	1	-1	1	1	3	1	3	3
25	1	8	0	1	1	0	0	1	1	1	-1	2	2	2	2	2	2
21	1	2	0	1	1	0	0	1	0	1	-1	2	2	2	2	2	2
2	1	2	0	1	1	0	1	1	1	1	-1	-1	-1	1	1	1	2
46	1	8	0	1	1	0	2	1	0	1	-1	-1	-1	1	1	2	3
16	1	2	0	1	1	0	1	1	1	1	-1	-1	1	1	-1	1	3
63	1	4	0	1	1	0	1	1	1	1	-1	-1	-1	1	1	1	2
14	1	8	1	1	1	0	0	1	1	1	-1	2	2	2	2	3	2

**Module
9**

2	1	4	0	1	1	0	1	1	1	1	-1	-1	-1	-1	1	1	2
21	1	13	1	1	-	0	2	-	-	1	-1	2	1	3	1	3	3

					1			1	1								
				-	-			-									
16	1	8	0	1	1	0	1	1	0	1	-1	2	2	2	2	2	2
				-	-			-									
46	1	8	0	1	1	0	1	1	1	-1	-1	2	2	2	2	2	2
				-	-			-									
39	1	4	0	1	1	0	2	1	0	1	-1	-1	-1	2	2	2	3
				-	-			-									
14	1	2	0	1	1	0	1	1	0	1	-1	-1	1	1	1	1	2
				-	-			-	-								
4	1	2	0	1	0	0	1	1	1	1	-1	-1	-1	1	1	1	2
				-				-									
25	1	4	0	1	1	0	1	1	0	1	-1	1	1	1	2	1	2
				-				-									
35	1	13	1	1	1	0	1	1	1	1	-1	2	1	2	1	3	2
				-				-									
71	1	8	1	1	1	0	1	1	1	1	-1	1	2	2	2	2	3
				-	-			-	-								
63	1	8	0	1	1	0	1	1	2	1	-1	-1	-1	2	2	3	1

CS 525:

Module	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
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1	8	0	1	1	-1	0	1	1	1	1	-1	1	1	2	2	2	3
2	4	0	-1	-1	-1	0	1	1	1	1	-1	-1	-1	2	1	-1	2
3	2	0	-1	-1	-1	0	0	-1	2	1	-1	2	1	2	1	-1	3
4	2	0	-1	-1	-1	0	0	-1	2	1	-1	-1	-1	2	2	1	3
5	13	1	1	1	-1	0	2	-1	0	1	-1	3	2	2	2	2	3
6	4	0	1	1	-1	0	1	-1	1	1	-1	-1	1	2	2	2	3
7	4	0	-1	-1	-1	0	0	1	1	1	-1	-1	-1	1	1	2	3
8	4	0	-1	-1	-1	0	2	1	1	1	-1	-1	-1	2	2	2	3
9	18	0	-1	1	-1	2	2	-1	0	-1	-1	1	1	3	3	3	3
10	8	1	-1	-1	-1	0	1	-1	1	-1	-1	-1	-1	3	3	2	2
11	8	1	-1	1	-1	0	1	1	0	1	-1	1	-1	3	2	2	2

Module	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1																	
9	13	1	-1	1	-1	0	1	1	0	1	-1	2	-1	3	3	3	2
2	8	0	-1	-1	-1	0	2	1	-1	1	-1	-1	-1	3	2	3	3
1	13	2	1	1	1	0	2	1	0	-1	-1	2	1	3	3	3	3
10	8	1	-1	-1	-1	0	1	-1	1	-1	-1	-1	-1	3	3	2	2
4	2	1	-1	1	-1	0	0	1	2	1	-1	1	1	1	1	1	3
7	4	0	1	-1	-1	0	1	1	-1	1	-1	2	-1	1	1	2	3
5	20	1	3	-1	-1	1	2	-1	0	-1	-1	2	2	2	3	3	1
11	18	0	-1	-1	-1	2	2	1	-1	-1	-1	2	-1	2	3	3	3
3	4	2	-1	-1	-1	0	0	1	0	-1	-1	1	3	3	-1	3	3
8	13	0	-1	-1	-1	0	2	1	0	1	-1	1	-1	3	2	3	3
6	4	0	-1	-1	-1	0	2	-1	0	1	-1	-1	2	3	2	3	3

Module	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
7	13	1	-1	-1	-1	1	0	0	0	-1	0	-1	2	2	2	2	2
6	8	1	1	1	-1	0	1	1	0	1	0	1	1	2	1	2	3
1	20	0	-1	-1	-1	0	1	1	-1	1	0	-1	-1	2	2	3	3
4	2	0	-1	-1	-1	0	1	1	1	1	0	-1	-1	1	1	1	3
10	8	0	1	-1	-1	0	1	1	0	1	0	-1	-1	2	2	2	3
3	4	0	1	-1	-1	0	1	1	-1	1	0	1	1	1	1	1	1
11	13	1	-1	1	-1	0	1	1	0	1	0	1	-1	3	3	2	2
9	18	0	-1	-1	-1	0	2	1	0	-1	0	-1	-1	1	2	3	3
5	13	1	3	1	-1	0	2	0	0	-1	3	2	3	2	2	2	2
8	4	0	-1	-1	-1	0	1	-1	-1	1	0	1	-1	2	2	2	3

Module	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
8	18	1	-1	-1	-1	0	1	-1	0	1	-1	-1	-1	2	2	2	2
11	18	1	-1	1	-1	0	2	1	0	1	-1	1	-1	3	3	2	2
3	18	1	1	-1	-1	0	1	1	-1	1	-1	-1	1	1	2	1	1
6	13	1	1	-1	-1	0	2	1	0	1	-1	2	1	2	1	3	3
7	8	0	-1	-1	-1	0	1	1	0	1	-1	1	-1	1	1	2	3
4	2	0	-1	-1	-1	0	0	-1	1	1	-1	-1	-1	1	1	1	3
10	20	0	-1	-1	-1	0	2	1	0	-1	-1	-1	-1	2	3	3	3
12	18	0	1	-1	-1	0	1	1	0	-1	-1	1	1	1	2	3	3
9	4	0	-1	-1	-1	0	2	-1	-1	1	-1	1	-1	2	2	2	3
1	20	1	1	1	-1	0	1	1	-1	1	-1	1	2	3	3	3	3

Module

3																	
6	13	1	1	1	1	0	1	1	0	1	1	1	1	1	1	2	2
1	18	0	-1	-1	-1	0	2	1	-1	1	-1	-1	-1	2	3	3	3
9	13	1	-1	-1	-1	0	2	1	0	1	-1	-1	-1	3	2	2	2
3	8	0	-1	-1	-1	0	0	-1	0	1	-1	-1	-1	1	1	-1	2
8	8	0	-1	-1	-1	0	2	1	0	1	-1	-1	-1	2	2	2	3
10	4	1	-1	-1	-1	0	2	-1	0	1	-1	-1	-1	2	2	2	3
4	2	0	-1	-1	0	0	0	1	2	1	-1	-1	-1	-1	-1	-1	3
11	18	1	-1	1	1	1	2	1	0	-1	-1	-1	-1	2	2	3	3
5	13	1	1	1	1	-1	2	-1	0	1	-1	2	1	2	2	2	3

Module

4																	
1	18	1	1	1	1	0	1	1	0	1	-1	1	1	3	3	3	3
6	13	1	1	1	1	0	1	1	0	1	-1	1	1	2	2	2	2
4	4	1	-1	-1	-1	0	1	-1	0	-1	1	-1	-1	-1	1	1	1
10	13	0	-1	-1	-1	0	1	1	0	1	-1	-1	-1	3	3	2	2
8	20	0	-1	-1	-1	1	2	-1	0	-1	-1	-1	-1	2	2	3	3
11	4	1	1	-1	-1	0	1	-1	0	1	-1	-1	-1	1	2	2	2
3	8	0	-1	-1	-1	0	0	-1	0	-1	-1	-1	-1	1	1	-1	1

Module

5																	
1	18	0	-1	-1	0	0	1	-1	-1	1	-1	-1	-1	1	-1	1	2
6	13	1	-1	-1	-1	0	1	-1	0	1	-1	-1	-1	2	2	2	2
4	2	0	-1	-1	0	0	1	1	0	1	-1	1	1	1	3	2	2
7	8	0	-1	-1	-1	0	-2	1	0	1	-1	-1	-1	1	1	2	2
11	13	0	-1	-1	-1	0	1	1	0	1	-1	-1	-1	3	3	3	2
3	18	0	1	-1	-1	0	-2	1	-2	1	-1	-1	-1	-1	1	3	1
9	20	0	-1	-1	1	1	2	1	0	1	-1	-1	-1	1	2	3	3
5	8	1	1	-1	-1	-1	1	-1	0	1	-1	2	2	2	1	3	3

Module

6																	
1	18	1	-1	1	0	0	1	1	0	1	-1	1	-1	1	1	3	3
9	13	1	-1	-1	0	0	1	1	0	-1	-1	-1	2	2	2	2	2
6	18	0	-1	-1	-1	0	1	1	0	1	-1	-1	-1	-1	1	2	2
4	4	0	-1	-1	0	0	1	1	1	1	-1	-1	-1	1	1	2	3
8	18	0	-1	-1	-1	0	0	1	0	1	-1	-1	-1	3	3	3	2
7	8	0	1	-1	-1	0	1	1	0	1	-1	-1	1	1	1	2	3
11	20	1	-1	-1	-1	1	2	1	0	-1	-1	-1	-1	2	3	3	3

Module

7																	
8	20	1	-1	-1	-1	0	1	-1	0	1	-1	1	-1	2	3	3	2
1	18	0	1	1	-1	0	1	1	0	1	-1	1	1	2	2	3	3
11	13	0	-1	-1	-1	0	1	1	0	1	-1	-1	-1	3	3	2	2
10	8	0	1	-1	-1	0	1	-1	0	-1	-1	1	2	2	1	3	2
4	2	0	1	-1	-1	0	1	1	1	1	-1	-1	-1	1	1	1	3
7	8	0	-1	-1	-1	0	0	1	0	1	-1	1	2	2	2	2	1
9	20	0	3	-1	-1	1	2	-1	0	-1	-1	1	2	2	2	3	3
0	13	-1	-1	-1	-1	0	1	1	-1	1	-1	-1	1	-1	1	-1	1

Module**8**

1	13	0	1	1	1	0	0	1	0	1	-1	1	1	3	2	3	3
10	18	1	1	1	1	0	1	1	0	1	-1	1	1	3	3	3	2
11	20	0	-1	-1	-1	1	2	-1	0	-1	-1	1	-1	2	2	3	3
4	2	0	-1	-1	-1	0	0	-1	2	-1	-1	-1	1	1	1	1	1
9	13	1	1	1	-1	0	1	1	0	1	-1	1	1	2	2	2	2
3	20	-1	-1	-1	-1	0	-2	-1	1	1	-1	-1	-1	1	2	-1	3
6	X	0	1	-1	-1	0	1	1	1	1	-1	1	2	1	2	1	3
5	4	1	-1	-1	-1	0	1	-1	0	1	-1	2	-1	2	2	2	3
8	13	0	1	1	-1	0	1	1	0	1	-1	-1	-1	1	1	3	2
7	4	1	-1	-1	-1	0	0	-1	0	1	-1	2	-1	1	1	2	2